The Teacher-Scholar

3) Challenging Beliefs to Promote Student Learning

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Students (and teachers) have a difficult time learning things that contradict their current understanding of the world; most of us believe that new information we receive confirms our earlier beliefs, theories, interpretations, and arguments. Often we seek out information that confirms these beliefs, while overlooking or avoiding contradictory views and data. When confronted with information that seems contradictory to what we believe, we perform "all kinds of mental gymnastics to avoid confronting and revising fundamental underlying principles" (Bain 2004, 23). And yet, to learn and grow, we must confront competing theories and evidence. To teach effectively, and promote student learning, we must encourage our students to do so, too.

As Jose Antonio Bowen reminds us in his 2012 book, *Teaching Naked*, there is extensive research into how young adults learn and how they develop as well as how we can have a long-term impact on students' understandings of the world. A teacher-scholar studies this research, applies best practices, and conducts classroom action research to determine what works best in his or her own classroom. Here are a few key findings from existing research that we should keep in mind when seeking to promote deep (lasting) learning:

1. The conceptual model of the brain as fixed has been replaced by new evidence that the architecture of the brain is flexible and is constantly shaped by experience (Zull 2004, Bowen 2012, 76).
2. If a neuron fires often, it grows and extends itself out toward other neurons, connects with them, sends signals back and forth through synapses. Synapses convert the isolated neurons into a network of neurons. The changes in the connections that make up these networks is learning (Zull 2004, 68; Bowen 2012, 77).
3. Two things cause networks to form: practice and emotion. When learners practice, the brain grows (Dragnski et al. 2004, Bowen 2012, 77).
4. Lasting learning is motivated by emotion and solidified by practice (Damasio 1994, Bowen 2012, 78).
5. A lecture can motivate students and stimulate emotion, but it does not give them much practice at forming their own explanations and networks, or much control over their progress (Bowen 78).
6. The consistent theme in the existing literature is that learning requires more than just new facts; it is motivated by forcing students to confront, analyze, and articulate compelling discrepancies that require change in what they believe (Bowen 2012, 80).
7. The best college teachers introduce facts "in a rich context of problems, issues and questions"

(Bain 2004, 29). They understand that mental models change slowly; pre-existing beliefs are difficult to change.

8. Student motivation and preconceptions are important. If students learn new information for the purpose of a test, they quickly revert to their old ways of thinking (Bransford & Brown, 2000).
9. A metacognitive approach that combines factual knowledge with an emphasis on conceptual frameworks, applications, and student control over learning fosters deep/lasting learning (Bransford & Brown, 2000, Bowen 2012).
10. Neuroscience suggests that the positive emotions in learning are generated in the parts of the brains that are used most heavily when students develop their own ideas. The frontal cortex and pleasure centers deep in the brain are stimulated by student ownership and independent thinking, rather than by explanations (Zull 2004, Bowen 2012).
11. The brain is not a blank slate waiting to be written upon or an empty bowl waiting to be filled. Contexts for learning include student apathy, contradictions to belief systems, religious or political beliefs, educational background, and psychological development (Bowen 2012, 89).
12. To foster lasting learning, educators should "engage the whole brain: Instructors should provide experiences and assignments that engage all aspects of the cerebral cortex: sensory cortex (getting information), integrative cortex (making meaning of information), integrative cortex near the front (creating new ideas from these meanings), and motor cortex (acting on those ideas)" (Zull 2004, 71).

What does all of this research say about good teaching? Simply lecturing to students is less effective than active learning in developing high-order cognitive skills. Delivering context alone has virtually no effect on students' beliefs about the world (Bowen 2012). As Bowen reminds us, students can memorize data that conflicts with their beliefs, but without active engagement with the new material in the form of discussions, writing, debates, projects, and hands-on applications, they do not really consider the implications of the new content for their existing understandings, beliefs, and worldview (92). All of the research cited above is consistent with Bloom's (1956) taxonomy of education objectives, and Krathwohl's (2001) revision of the taxonomy into the form most widely used today. By classifying cognitive skills into six levels of increasing complexity, with each higher level assuming mastery of all of the previous levels, we are reminded that the goal is not to test students on their ability to remember, retrieve, recognize, or recall relevant facts, but, rather, to produce students who understand key concepts, apply knowledge to solve new problems, analyze data, structures, or situations, evaluate programs, policies, and practices, and create new knowledge: generating new ideas, planning new programs, or producing new organizations that reflect their working knowledge and beliefs about politics, public policy, and the public good.

The best teachers focus on challenging students in a supportive environment where failure is tolerated. Ingredients for success seem to include both high standards and a low risk of failure (i.e. opportunities to experiment, fail, learn, and try again). Student learning thrives when opportunities for active learning combine with a sense of control and a belief that the professor wants them to succeed (Bain 2004). It's a tall order, but we are up to the task. Colleagues, please share how you are helping students to challenge their existing mental maps and to gain new – and deeper -- understandings of the world around them. I look forward to hearing your stories of active learning using research-based best practices. Being a teacher-scholar means using the best research available to inform our teaching. Being a community of teacher-scholars means sharing best practices and research findings with others so that we may continue to learn and grow together. I am eager to hear from you! I am eager to learn.

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